

WHAT IS CLAIMED IS:

1. A substrate cleaning method for cleaning a substrate using a cleaning liquid comprising at least one selected from the group consisting of an aqueous solution of ammonium fluoride, and a mixture of an aqueous solution of ammonium fluoride and hydrofluoric acid, comprising the steps of:

dipping and cleaning the substrate in said cleaning liquid; and

adding a replenishing liquid comprising at least one selected from the group consisting of water, ammonia, aqueous ammonia, and an aqueous solution of ammonium fluoride with lapse of time during said cleaning liquid is used.

2. The substrate cleaning method according to Claim 1, further comprising the step of measuring characteristics of said cleaning liquid, wherein a kind and an amount of said replenishing liquid are determined in response to a result of the measurement of said cleaning liquid.

3. The substrate cleaning method according to Claim 2, wherein, in the measuring step, hydrofluoric acid concentration is measured at a predetermined time interval and water is fed as said replenishing liquid so that a measurement value of said concentration falls within a predetermined range.

4. The substrate cleaning method according to Claim 2, wherein said characteristics of said cleaning liquid is

measured by at least one measurement selected from the group consisting of measurements of an absorbance at a predetermined wavelength, an infrared absorption spectrum, an ultraviolet absorption spectrum, an index of

5 refraction, a specific gravity, a transmittance, and an electric conductivity, a measurement by means of a moisture titrator, and a measurement by means of liquid (ion) chromatography.

10 5. The substrate cleaning method according to Claim 3, wherein said hydrofluoric acid concentration of said cleaning liquid is measured by at least one measurement selected from the group consisting of measurements of an absorbance at a predetermined wavelength, an infrared

15 absorption spectrum, an ultraviolet absorption spectrum, an index of refraction, a specific gravity, a transmittance, and an electric conductivity, a measurement by means of a moisture titrator, and a measurement by means of liquid (ion) chromatography.

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6. A substrate cleaning apparatus for cleaning a substrate, comprising:

a substrate cleaning bath containing therein a substrate cleaning liquid comprising at least one liquid

25 selected from the group consisting of an aqueous solution of ammonium fluoride, and a mixture of an aqueous solution of ammonium fluoride and hydrofluoric acid; and

liquid feeding means for feeding a liquid comprising at least one selected from the group consisting of water, ammonia, aqueous ammonia, and an aqueous solution of ammonium fluoride.

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7. The substrate cleaning apparatus according to Claim 6, further comprising:

measuring means for measuring characteristics of
5 said cleaning liquid in said substrate cleaning bath; and
control means for arithmetically processing a signal
from said measuring means to control the feeding of the
liquid from said liquid feeding means to substrate
cleaning bath.

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8. The substrate cleaning apparatus according to Claim 7, wherein said measuring means comprises means for measuring at least one wavelength characteristic selected from the group consisting of an absorbance at a
15 predetermined wavelength, an infrared absorption spectrum, an ultraviolet absorption spectrum, and an index of refraction.

9. The substrate cleaning apparatus according to Claim 20 7, wherein said measuring means comprises means for measuring at least one physical value selected from the group consisting of a specific gravity and a transmittance.

25 10. The substrate cleaning apparatus according to Claim 7, wherein said measuring means comprises means for measuring an electric conductivity.

11. The substrate cleaning apparatus according to Claim 30 7, wherein said measuring means comprises at least one measurement means selected from the group consisting of a

moisture titrator and liquid (ion) chromatography.

12. The substrate cleaning apparatus according to Claim
7, wherein said measuring means measures hydrofluoric
5 acid concentration of said cleaning liquid.

13. The substrate cleaning apparatus according to Claim
12, wherein said measuring means comprises means for
measuring at least one wavelength characteristic selected
10 from the group consisting of an absorbance at a
predetermined wavelength, an infrared absorption spectrum,
an ultraviolet absorption spectrum, and an index of
refraction.

14. The substrate cleaning apparatus according to Claim
12, wherein said measuring means comprises means for
measuring at least one physical value selected from the
group consisting of a specific gravity and a
transmittance.

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15. The substrate cleaning apparatus according to Claim
12, wherein said measuring means comprises means for
measuring an electric conductivity.

16. The substrate cleaning apparatus according to Claim
12, wherein said measuring means comprises at least one
measurement means selected from the group consisting of a
moisture titrator and liquid (ion) chromatography.